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Mung bean juice as a phytotherapy development to increase hemoglobin levels in adolescent girls, Banten, Indonesia

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ABSTRACT

Adolescent girls are very susceptible to anemia due to growth and the arrival of menstruation. Providing food that is expected to increase iron adequacy in adolescents is mung bean juice, because mung beans can prevent a decrease in hemoglobin levels. The aim of this research is to determine the effect of drinking mung bean juice on increasing hemoglobin levels in adolescent girls. The research is pre-experimental analytical research with a One group pre-test post-test design approach. The population in this study were all 12 young women at Al Hadi High School 2024. The sample in this study was all 12 young women at Al Hadi High School Banten. The sampling technique is total sampling. The data analysis used in this research was the paired T test. The results of the study showed that there was a strong relationship between giving mung bean juice and increasing hemoglobin levels in young women (p=0.002). Adolescents are expected to have awareness and understanding of nutritional requirements as an effort to prevent anemia in adolescents and encourage young women to regularly consume mung bean juice drinks.

Introduction

Teenagers are at risk of nutritional problems. In adolescence, the body requires more energy due to rapid growth and development. In addition, changing lifestyles and habits, such as the desire to experiment with food, cause discrepancies in energy intake and other nutrients. Adolescent girls also require special attention to their iron needs due to their growth and the arrival of menstruation, so they are very vulnerable to anemia (Sediaoetama, 2015).

Anemia is a condition in which the number of red blood cells or the concentration of hemoglobin (Hb) in them is lower than normal. Hemoglobin is needed to carry oxygen, and if there is too little, abnormal, or not enough hemoglobin, the blood's capacity to carry oxygen to body tissues will decrease (WHO, 2021). Both developing and developed countries experience anemia. Anemia at any age has a significant impact on human health and socio-economic.

WHO says that 1.62 billion people, or 24.8% of the world's population, suffer from anemia. The organization targets reducing the prevalence of anemia worldwide to 15% by 2025. More than 25% of teenagers in Southeast Asia (excluding Thailand) experience anemia. In some countries, this can reach 50% (Ningrum, 2021). In Indonesia, the prevalence of anemia reaches 48.9%. This number continues to increase from 6.9% in 2007 to 32.0% this year. Globally, anemia is more common in adolescent girls than in adolescent boys. In Indonesia, for example, the prevalence of anemia in adolescent girls is 27.2%, 6.9% higher than in adolescent boys (Kemenkes RI, 2018).

Food, age, gender, activity, smoking, and related diseases such as leukemia, thalassemia, and tuberculosis affect a person's hemoglobin and red blood cell (erythrocyte) levels. According to Rona (2020), iron and protein are used to form hemoglobin (Rona, 2020). Anemic teenagers in Indonesia face decreased immunity, concentration, learning achievement, fitness and productivity. Anemia can also cause pregnancy complications such as premature delivery, low birth weight babies, or death due to bleeding during childbirth (Kemenkes RI, 2018). Adolescent girls are more susceptible to anemia than adolescent boys, this is due to nutritional problems such as chronic energy deficiency (CED), obesity and anemia. Iron loss during menstruation, behavior and unhealthy eating habits are some of the factors that can cause an increase in iron requirements (Zulmi et al., 2022).

The current and future effects of anemia in adolescent girls include delayed growth, a tendency to get infected, weakness and hunger, easy drowsiness, decreased enthusiasm for learning, impaired study concentration, and decreased test scores. Apart from that, the effects of anemia on young women after marriage and producing the nation's next generation are vulnerable, resulting in fetuses being conceived by WUS (Jannah & Anggraeni, 2021).

According to the World Health Organization (WHO), around 53.7% of adolescent girls in developing countries experience anemia. Hb levels are considered normal if they are more than 12 grams; mild anemia ranging between 10 and 11 grams; moderate anemia ranges between 8 and 10 grams; and severe anemia if the Hb level is less than 8 grams (Mariyona, 2020).

According to the World Health Organization (WHO), around 53.7% of rem. Apart from using blood supplement tablets, anemia treatment can also be done using non-pharmacological methods. Mung bean juice, for example, is thought to increase iron adequacy in teenagers and prevent a decrease in hemoglobin levels. To maintain optimal health, nutritional and health interventions must be carried out at every stage of the life cycle, including preconception, pregnancy, infancy, toddlers, school-aged children and adolescents. Interventions for adolescent girls and WUS (Women of Childbearing Age) are very important because the quality of the next generation's human resources will be determined (Amirul Amalia, 2016). Even girls in developing countries experience anemia. Hb levels are considered normal if they are more than 12 grams; mild anemia ranging between 10 and 11 grams; moderate anemia ranges between 8 and 10 grams; and severe anemia if the Hb level is less than 8 grams (Mariyona, 2020).

Mung beans (Phaseolus radiatus L.) contain vitamins and minerals such as calcium, phosphorus, iron, sodium, potassium, and many more which are needed for the formation of red blood cells and to overcome the effects of lowering Hb. Increasing iron consumption in food can prevent anemia. The iron content of mung beans is 6.7 mg/100 g which is considered to prevent anemia. According to Mariyona (2020), the nutrients in mung beans are not only found in several enzymes which are responsible for the processes of catabolism, oxidative metabolism, deoxyribonucleic acid synthesis, neurotransmitter transmission, and the formation of hemoglobin, which functions for the storage and transport of oxygen (Mariyona, 2020).

Several studies have investigated the effects of mung beans on anemia. For example, Mariyona in 2019 found that giving mung bean juice caused an increase in hemoglobin levels in young women suffering from anemia, and additional research by Harisandi in 2023 found that giving mung bean juice caused an increase in hemoglobin levels in the blood. Carolin also found the same thing for teenagers who suffered from anemia (Carolin et al., 2021; Harisandi et al., 2023; Mariyona, 2020).

There is so much research on anemia in teenagers, but there is still very little research on the phytotherapy/non-pharmacological

treatment of anemia, especially mung beans, and no research has been conducted on teenage girls who are in vocational/high school. Based on a preliminary survey of Al Hadi Vocational School female students, it was found that there were still teenagers who were anemic. Therefore, researchers are interested in conducting research on giving mung bean juice as a phytotherapy development to increase hemoglobin levels in young women. The aim of the research was to determine the effect of drinking mung bean juice on increasing hemoglobin levels in adolescent girls.

Method

This research is analytical research. The design used in this research is analytical with a pre-experiment approach with a One Group pre test-pot test group design. The population in this study was all 12 young women attending Al Hadi High School in 2024. The sample in this study was all 12 young women. The sampling technique is total sampling. The sample was determined based on the inclusion criteria, namely young women who had menstruated and were willing to become respondents, the exclusion criteria were young women who had a history of certain diseases.

This research was conducted at Al Hadi High School. This research was conducted in February 2024. The data used is primary data by conducting interviews with respondents using research questionnaires, measuring height and weight, and measuring hemoglobin (Hb) levels. The research instruments in this study were a research questionnaire, a midwife's scale, a height meter and an easytouch brand electric Hb checker. Height and weight measurement to determine body mass index according to WHO theory, with the classification of measurement results are : BMI < 18.5: Underweight, BMI 18.5 - 24.9: Normal weight, BMI 25.0 - 29.9: Overweight and BMI ≥ 30: Obesity. However, in this study, the categorization of nutritional status was divided into three categories, namely less (if the BMI status is underweight), normal (if the BMI status is normal) and over (if the BMI status is overweight and obesity). The green bean juice drink given was a packaged drink containing green bean juice with the Ultra trademark, 250 ml given to respondents for 7 days.

Data processing using spss 25 software. Data analysis used in this research is univariate analysis using percentages, bivariate analysis using the T test. This is because the data is normally distributed with the results of the normality test using Shapiro Wilk, the p value is 0.408 for pre Hb levels test and 0.113 in post-test Hb levels.

Ethical clearance for the research was obtained from the ethics committee of Universitas Muhammadiyah Prof. Dr. HAMKA (UHAMKA) under the reference number 03/24.01/03051.

Results and discussion

Table 1. Respondents' Characteristic (n=12)

Category	Respondent Group	
	N	%
Age (in years)		
15	6	50
16	4	33,3
18	2	16,7
Age of menarche (in years)		
12	**6**	50
13	**2**	16,7
14	**4**	33,3
Nu1tritional status		
Less	4	33,3
Normal	6	50
Over	2	16,7

Table 1 shows that the majority of adolescents aged 15 years as much as 6 respondent (50%), experienced menarche at the age of 12 years as much as 6 respondent (50%), and had normal nutritional status as much as 6 respondent (50%).

Table 2. The effect of mung bean juice on hemoglobin levels (n=12)

Hemoglobin levels	Mean	SD	SE	P value
Before being given mung bean juice	14,317	0,929	0,268	0,002
After being given mung	15,117	0,828	0,239	

bean juice

Table. 2 shows that the average hemoglobin level in teenagers before being given the mung bean juice drink was 14,317, whereas after being given the mung bean juice drink the average hemoglobin level in teenagers increased to 15,117. The P value of the T test was 0.002, indicating that there was a difference between the hemoglobin levels of female teenagers pre-test and post-test when they were given mung bean juice.

Adolescent girls are more at risk of suffering from anemia than adolescent boys. Adolescent girls need more iron due to imbalances in nutrient intake, growth factors, and monthly menstrual cycles. Adolescent girls who experience anemia can also be caused by dietary restrictions and habits that limit food consumption (Akib & Sumarmi, 2017).

Foods that are expected to increase iron adequacy in adolescents can be used to prevent anemia. To maintain optimal health, nutritional and health interventions must be carried out at every stage of the life cycle, including preconception, pregnancy, infancy, toddlers, school-aged children and adolescents. Intervention for adolescent girls and WUS (Women of Childbearing Age) is very important because the quality of the next generation's human resources will be determined.

The dietary approach method helps prevent nutritional anemia by increasing micronutrient intake. In a food-based approach, the first thing that must be considered is production, processing, marketing and food preparation. After that, food distribution to families and vulnerable groups. It is very important to increase consumption of foods that can increase iron absorption, such as nuts, fish, beef, poultry, and mung leafy vegetables, as well as foods that contain iron such as vitamin A, vitamin C, and folic acid. Facilitating access to food sources must be considered.

Mung beans (Phaseolus radiatus L.) are a source of vegetable food that is rich in nutrients and helps the body's health. Mung beans contain all the vitamins and minerals the body needs, and can help increase blood hemoglobin levels by adding iron (Ajeng Amalia & Tjiptaningrum, 2016). Iron is one of the minerals in mung beans, with an iron content of 6.7 mg/100 g. Micro minerals are an important part of hemoglobin synthesis. Hemoglobin levels in the blood, especially in girls, can be influenced by giving mung bean juice. With proper and correct processing, this provision can prevent anemia at an affordable price and can be processed independently (Harisandi et al., 2023).

Mung beans (Phaseolus radiatus L.) are a food ingredient that contains substances needed for the formation of red blood cells so that they can overcome the effects of decreasing Hb. Due to the very complete phytochemical content in mung beans, which can help the process of hematopoiesis, mung beans (Phaseolus radiatus L.) also play a role in the formation of red blood cells and preventing anemia (Mariyona, 2020).

Mung bean seeds that are boiled or processed and then eaten have high digestibility and less flatulence. Hemagglutinin has the ability to agglomerate red blood cells and is toxic. Heating at a temperature of 100oC can be used to destroy the toxicity of hemagglutinin. Phytic acid can form complexes with iron or mineral elements, especially zinc, magnesium and calcium. Because it is difficult for the body to absorb, phytic acid becomes less available in the body. The body can obtain more iron through the fermentation process. This is very important to avoid iron nutritional anemia. In addition, mung beans contain vitamin C, which functions to convert ferric to ferrous. These mung beans are good for pregnant women who suffer from anemia. Research by Suheti et al. (2020) showed that the average Hb levels were different before and after the mung bean intervention (Carolin et al., 2021; Suheti et al., 2020).

The results of the study showed that drinking mung bean juice had a significant effect on increasing hemoglobin levels in adolescent girls. To prevent anemia in teenagers, it is hoped that teenagers will have awareness and understanding about fulfilling nutrition. Apart from that, it is recommended that teenage girls consume mung bean juice regularly.

Conclusion

The conclusion that can be drawn from this research is that there is a relationship between drinking mung bean juice and increasing hemoglobin levels in young women. Adolescents are expected to have awareness and understanding of nutritional requirements as an effort to prevent anemia in adolescents and encourage young women to regularly consume mung bean juice.

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